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I. The Krishna Sagara Raja Sagara Dam was projected in two stages (1) to store 80 feet of water to augment the normal flow of the Cauvery at Sivasamudram and enable us to supply an additional 5000 H.P. of electrical energy to the Kolar Gold Mines and (2) to store 110 feet of water to be increased with the aid of automatic shutters to 118 feet. The first stage may be called the power stage with some irrigation auxiliary to power production. The second stage was intended solely for the irrigation, by means of a High Level Canal taken at the 60 feet Level, of about 200 square miles of land in the Mandya and Malvalli Taluks. The first stage stores 11032 M.C.ft while the second stage stores 37082 M.C.ft above the 60 ft level. Two estimates were made for the first stage. (1) of 66½ lacs for the 80' Dam by itself and (2) of 81 lacs on foot of its having to carry the second stage. The 118' Dam was estimated at 138 lacs and it was stated in the project estimate of 5-5-11 that this figure of 138 lacs may be taken as final. The approved estimate for the 118' Dam was 138¾ lacs. The High Level Canal was to cost 108½ lacs and the approved estimate put the cost at 115 lacs.

II. When in Oct. 1910 we applied for the consent of the Madras Govt., that Govt. after a year's delay gave a conditional consent to the first stage, but as regards the second or irrigation stage they flatly refused even to look at it. Mr. Chakravarti too had penned a powerful indictment of the second stage mainly on the ground that such irrigation dams had never paid in the past. But Sir Viswesvaraya assured us on 5-5-11 'there is every reason to expect that the expenditure on the Cauvery Reservoir will prove a very remunerative investment, whereas from the first the Marikanave Scheme has been regarded merely as a useful protective work.' He also added ' once commenced, the scheme opens up a vista of possibilities of ever-increasing value to the State. But the speed with which developments take place will not be spontaneous, but

but must depend entirely on the energy and foresight displayed by the responsible Government in improving the market for power and extending irrigation'. His views were accepted, we took the risk of the Madras veto being upheld by the final authority, we even neglected to fix upon a permanent site for the waste-weir of the first stage dam and forthwith started the costlier 80' dam estimated at 81 lacs. This was in October 1911.

3. There was a dead-lock between Madras and Mysore even as regards the working of the first stage, a costly arbitration followed, our right to proceed to the second stage, if we wished, was upheld in April 1914, bur our right to storage was subjected to the onerous condition that right through the year we should ensure a flow of 900 C.Ft at the British Frontier at Sivasamudram It however/so happened that this 900 cusecs was just the flow that would enable us to generate 32000 H.P. at the C.P. works as well as 5000 H.P. at the Dam itself by an independent installation. For this latter purpose however a minimum level of 58' (as then thought) had to be maintained in the Lake. The Arbitrators' decision was confirmed by the India Government in April 1916.

4. Meantime as the first stage would submerge 10400 acres five canals were opened or extended to re-settle the expropriated ryots. 4600 acres were made available under two Low Level canals drawn from the Lake at 40' above bed level. About 20500 acres were secured under extensions of the Hemagiri and Mandgere channels and under the Chamaraj right bank channel sanctioned by H. H. the late Maharaja so far back as 1893 when the late Mr. Thumboo Chetty was Offg: Dewan. The 25000 acres under these five channels are entitled only to Monsoon irrigation. The Mandgere, Hemagiri and Chamaraj channels are above the Lake and do not appreciably effect its storage. The first stage storage was effected in 1916 and the final revised estimate came to nearly 104 lacs. The canals were opened in June 1918

and are estimated to cost~~ly~~ finally 27 lacs. In the result the first or power ~~storage~~ stage ensures at a cost of 131 lacs, a flow of 900 cusecs at Sivasamudram, the generation of 35000 H.P at the C. P. works and the Dam, as well as Monsoon irrigation for about 25000 acres. If we had contended ourselves with a 80' dam and the less costly estimate of 66½ lacs, the total expenditure would have been about 112 lacs. I shall deal with the financial aspect of the first stage later on.

5. The Committee deal with the first stage in paras 18 to 24 of their report. In para 24 they reiterate the original idea of treating the first stage 'as primarily a power scheme with irrigation playing a subsidiary part' 'while the second stage' they say 'should be devoted to the development of irrigation'. In para 23 they say 'none of the storage of the second stage will be required for power purposes as the first stage will supply all the 900 cusecs as noted above'. The figures they give in para 18 however differ in important particulars from those of Mr. Forbes whose notes on his requirements is appended to the report. Mr. Forbes requires a net flow of 7698 M.C.ft from the Krishnarajasagara to ensure 900 cusecs at Sivasamudram. His note as well as the report show 806 M.C.ft for loss by evaporation &c. The Committee does not refer to the inflow and if they had mentally reducted it from Mr. Forbes' 7698 M.C.ft the requirements of Sivasamudram will be 5300 M.C.ft, while the figure in the report is 5688 M.C.ft. Again para 18 says the effective balance in the Lake will be 3680 M.C.ft corresponding to ~~+~~ 58 in the reservoir. Adding 150 M.C.ft below 12', the balance will be 3830 M.C.ft which is very much nearer 57' than 58'. In para 20 of the report the Committee say that Mr. Forbes informed them that with a minimum level of ~~+~~ 58 he could generate 3000 H.P. at the dam site. In para 5 of his note Mr. Forbes makes out the balance in the

Lake as 4926 M.C.ft and says that 'if this balance is drawn off there is no use in putting a power station at the Dam, as it can only be worked when the water level is at or above R. L. 2408'. R.L. 2408 is 64 but 4926 M.C.ft will give only a little above 62. Mr Forbes also appears to differ from himself in this matter. In his note appendix II to Mr. Banerji's memo of 6th April 1921 he says that a reasonable variation of head will be within Pt, 2403 and 2454 ft, which implies a minimum level of 59 ft. Mr. Forbes has also signed the Committee report as a member.

6. With a minimum level of 64 ft the balance between 64' and 80' will be 11032 - 2398 - 806 = 5334 or 7290 M.C.ft. This quantity is 408 M.C.ft less than the 7698 M.C.ft required by Mr. Forbes to ensure a flow of 900 cusecs at Sivasamudram. As we are bound to ensure this flow by the award, the dam station will have to be given up. As the irrigation claims set out in clauses 3 and 4 of para 22 take precedence over the demands of the dam station, it is doubtful if the latter can work continuously even if the minimum level is lowerd to 58'. I notice however that in appendix I to Mr. Banerji's memo of 6-4-21 the late Mr. K. Krishniyengar makes out under the heading 'natural flow available in a bad year' that the Cauvery supplies only 2398 M.C.ft while the Kabbani yields 5078 m.c.ft or more than twice as much. Mr. Forbes takes the same figure (2398) for the Cauvery, but seems to give only 1258 M.C.ft to the Kabbani. I take his figure 3656 below Col:C of his table in Appendix II to Mr. Banerji's memo as the combined flow of Cauvery and Kabbani above Sivasamudram. Per contra Mr. K. Krishnaiyengar estimates the wastage between the dam and Sivasamudram at 25 per cent while Mr. Forbes estimates it at ten per cent. If the Kabbani yields only 1258 M.C. ft and the wastage is 25 per cent then a power station at the dam is quite out of the question. If on the other hand the Kabbani furnishes twice as much as the more motherly Cauvery

with the Hemavati and Lakshmana Tirtha, we can in any case safely assign to the first stage all the duties set forth in para 22 of the report. These differences on questions of fact between professional men are puzzling to the lay man and should be elucidated by the Committee.

7. I will now consider the financial aspect of the first stage. The five canals subsidiary to it, estimated to cost 27 lacs, will yield, when the entire area of 25000 acres is brought under cultivation, a net revenue of one and half lac a year. The Cauvery power works the last legacy of Sir Seshadriyer to the State he loved so well, were installed in 1902 and up to the end of 1912-13 yielded a net average annual return of twelve per cent and a net profit of eighty six lacs on a capital outlay of eighty three lacs. In 1913-14 the fourth installation was started and two more installations have been added up to date. By spending about 172 lacs on these installations, an installation at the dam site, and on subsidiary works to let in the Power, Mr. Forbes proposes to secure with effect from 25-26, a net Revenue of twenty two and half lacs per annum on an additional power production of 22000 H.P. Thus the first stage and the canals costing 131 lacs the additional power works costing 172 lacs, in all 303 lacs, will yield from 25-26 a net Power Revenue of 22½ lacs and a net irrigation Revenue of one and half lacs in all about 24 lacs on the entire expenditure on the first stage Reservoir and the canals and Power works it rendered possible, we get a return of nearly eight per cent. If the cheaper first stage had been adopted and a proportionate expenditure of 85 lacs incurred, the return would be a little over nine per cent. In any case the first or Power stage would be a paying proposition.

8. The original C. P. works had been in operation and earned more than their capital outlay before the first stage storage was commenced. They are a distinct entity and must be

omitted from consideration in judging of the fruits of the first stage storage. For the sake of convenience, we may, for the future, have a single capital and Revenue account for the original Power Works, the first stage storage and the canals and Power works subsidiary to that storage. The total capital outlay would then be 386 lacs and the net annual Revenue 34 lacs a return of nearly nine per cent. Reducting six and half per cent the minimum interest at which we have been able to raise the most recent long term loan, the net profit is 9¾ lacs a year or two and half per cent. The Committee assume that this profit (which they make out to be 24 lacs) almost all of it from Power, will last for all time and purpose to finance the irrigation stage out of the Power stage profits. This is impracticable as well as wrong in principle.

9. The Mines have not bound themselves to take the extra Power they have applied for, for any definite period. Such a guarantee was taken with reference to the intial Power supply of 1902 but that guarantee has also expired. Mr. Boquet referring to the Champion Mine in page 11 of his report for 21-22 says 'there is every likelihood of the mine being worked out by the end of 1923.' If that happens we shall in the very near future lose a fifth of our Royalty, a fifth of our present Power Revenue on 16800 H.P. as well as a lac by way of Income-tax, in all about seven lacs. The total of old and new demand according to Mr. Forbes is 33500 H.P.. Mr. Forbes does not say if the Champion Mine has applied for extra Power. If that Mine is closed down the total demand will be 30000 H.P. and the profit on a Power supply of 3500 H.P will be reduced by 40 per cent.

10. The other Mines are no doubt converting their steam plant to the electric drive and investing in new machinery, but Mr. Forbes does not say how long it will take to recoup the extra expenditure by the higher economy of the electric drive.

But the production of gold is steadily diminishing and if the Fields are exhausted say in fifteen years if not earlier, we shall lose by degrees about sixty lacs of Revenue from Royalty, Power, Excise, income-tax &c and have to close down the Betamangal water works and the K. G. F. Railway, and take down the fourth, fifth and sixth installations in the C. P. Works. As for new demands to replace those of the Mines, electrifying the Railways is too costly for this poor country. I understand that electrifying our best paying section between Bangalore and Mysore will cost two crores. The gross revenue of this section is fifteen lacs and its working expenses in the hands of the company ten lacs. We might save two and half lacs a year by electrifying but the interest on two hundred lacs will be twelve and half lacs a year. The conversion will therefore result in an annual loss of ten lacs. There is however a new demand for 5500 H.P. in Bangalore and Mysore, but ¾ of this comes from four large spinning and weaving mills. The total consumption in Mysore and Bangalore by 25-26 will be 10500 H.P. but even if this doubles in the course of fifteen years the exhaustion of the Mines will reduce the net demand from 35000 to 21000 H.P. and the net Revenue of 32½ lacs assumed by the Committee to 10½ lacs The Committee's idea of financing the irrigation stage for 40 long years out of Power profits is chimerical. We are in a bad way financially and may not further provoke the anger of the Gods by letting our enthusiasm run away with our judgment.

11. I will now come to the second or irrigation stage. This was intended solely for irrigation by a High level canal of about two hundred Sq Miles in the Mandya and Malavalli Taluks. It was considered a very remunerative irrigation work unlike the Marikanave. So it appeared by under-estimating the cost of the second stage as well as the High level canal, by over estimating the Land Revenue, contribution and sale proceeds of

lands and by nearly trebling the usual irrigation duty of a cusec. The canal was to cost 106 lacs and the entire dam works 139 lacs. The canal work could be completed in six years and 120 lacs would be realised as contribution and from sale proceeds of lands and the net annual Revenue would be 13.5 lacs. In other words the cost of the canal would be more than recouped by contributions and sale proceeds and we should realise a net revenue of 13½ lacs on a net capital outlay of nothing. In his memo of January 1919 however Sir Visvesvaraya says the canal would cost 160 lacs. He gave no reasons as to why he raised the sanctioned estimate of 115 lacs to 160 lacs, but significantly adds 'an accurate estimate of the cost of the tunnel should be made by a study of similar works, the latest being the Malakand in Swat... Two selected officers may be deputed for studying similar tunnel works.... The work being practically the first of its kind in the State very careful preparation is necessary before commencing construction'. This study, so essential a pre-requsite[1] to commencing the canal, has not been made, and yet the Committee has raised Sir Visvesvaraya's estimate of 160 lacs to 245 lacs, reduced his net receipts of 13½ lacs to 9.30 lacs and the amount of contribution and sale proceeds from 120 lacs to 75 lacs. The dam estimated at 139 lacs will cost according to the Committee 232 lacs exclusive of the cost of protective works in thr Waste Weir valley a question which our Engineers have apparently not yet seriously tackled though the safety of the dam is bound up with it. Such is the foresight with which our projects are worked out and launched and there is reason to believe as I shall show later on that the cost of the reservoir will be a great deal more than 232 lacs. T h e Committee's estimate for the canal is only a preliminary one and the canal bed will be 155 feet below the Hulikere ridge. Our Engineers have no practical experience of the large sums a long deep tunnel will devour, they have not studied similar

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tunnels elsewhere and if its cost rises like that of the dam works for which we were asked to accept 138 lacs as final, the canal will probably cost us five hundred lacs.

12. I will now come to the Committee's detailed estimate for the complete dam. (a) In para 8 they say that expenditure up to end of June 1921 is 168 lacs. In para 12 they imply that the total expenditure up to end of 21-22 will be 176 lacs. But in the Fore-cast statement annexed to the report the total cost of the reservoir up to 21-22 is only 168 and odd lacs. According to their own showing they have omitted eight lacs. The Budget for 23-24 shows against Krishnarajasagara and allied works an actual expenditure of 203½ lacs up tp the end of 21-22. That this figure does not include the upper and Lower level canals appears from the fact that under 'net receipts' credit is taken only for the Reservoir's share of Power Revenue. The Committee submitted their report four months before the expiry of 21-22 and if the more authoritative figure in the 23 - 24 Budget is correct, 55 lacs must be added to the 168 lacs shown in the Fore-cast statement as the total expenditure on the Reservoir up to end of 21-22. (b) I now come to the Committee's figure as regards compensation. In para 15 of the Financial Secretary's note of 5th September 1919 it is said 'there is besides the value amounting to 23¼ lacs of the land given in exchange to expropriated ryots'. If this land had been sold by auction, the sale proceeds would have fetched interest and 23¼ lacs must therefore be added to the expenditure on the Lake under 'compensation'. We are now in debt and are paying heavy interest on it. In para 12 of the report it is said 'a sum of 24 lacs will be necessary from 22-23 to bring the storage to 106 feet and an additional sum of 13 lacs for compensation'. In para 13 the Committee 'recommend that his sum of 24+13= lacs should be spent on raising the dam to store 106 feet for the present'. On the face of it , it looks as if thirteen lacs

represents compensation for the area submerged between 80 and 106 feet or 10600 acres. If that is so, the report as well as Fore-cast table omit all reference to the compensation payable for submersion between 106' and 124' storage. In para 49 again the Committee say that it was brought to their notice that the cash system would involve a payment of 21 lacs 'for compensation in the second stage' while exchange would cost only 13 lacs. What they mean by 'second stage' is not clear but from what we can gather from the report itself, it must be the 106' ~~storage~~ stage which according to para 13 requires an expenditure of 13 lacs as compensation 'for raising the storage to 106ft'. But the note of the Special Land Acquisition Officer appearing on page 32 of the report as an unmarked appendix tells a different story. His second stage is neither 106' nor 124' but a 120' stage. If this is correct then 13 lacs cover the compensation for lands submerged up to 120'; compensation up to 106' would therefore be much less and the Committee should not have told us that '24 ~~+~~ 13 lacs should be spent on raising the Dam to store 106' for the present'. Supposing their second stage is 120' they have made no attempt to deal with the submergence between 120' and 124' of about 2700 acres and the compensation for the occupied portion thereof. (b2.) The Land Acquisition Officer says that 2668 acres have already been acquired for the second stage by voluntary relinquishment. He does not say how much of this acreage is dry, wet or garden. Presumably by 'voluntary relinquishment' he does not mean a gift to Government and there is nothing to show the consideration for this relinquishment. In para 27 of his memo Sir Visvesvaraya says that the additional area submerged by the second stage is 2500 acres wet and garden and 6000 acres dry. The total area according to the Land Acquisition Officer is nearly 10000 acres. As to the wet and garden lands submerged by the second stage Sir Visvesvaraya and the Land Acquisition Officer are in close agreement, 2500 acres according to the former and 2400 according to the latter. In para 9 of his memo

Sir Visvesvaraya says that about 11000 acres of wet and garden land will be submerged by the Reservoir when completed to the full height. In para XVI of the Project Report of Mr. Subba Rao it is stated that the first stage at 92' or high flood level, will submerge 5321 acres of wet and garden land. If so, the second stage must submerge an extra 11000 - 5321 or 5679 acres of wet and garden land, whereas that area is only 2500 acres according to Sir Visvesvaraya and 2400 according to the Land Acquisition Officer. But to worse confounded confusion the Committee say in para 28 of their report 'these three canals bring under irrigation 20000 acres of new land against about 10000 acres of wet land that will be submerged in the second stage'. I take ~~it they use the~~ words 'in the second stage' in the sense in which they use them in para 49 of their report when they speak of 'compensation in the second stage'. That would virtually quadruple the figures for wet and garden given by Sir Visvesvaraya and the Land Acquisition Officer and as the latter estimates an acre of wet or garden land at 500Rs, compensation for the 10000 acres will amount to 50 lacs. Possibly the Committee mean 'in both the stages' when they say 'in the second stage'. I may add that the first stage acquisition is not yet complete, and 602 acres and 685 houses have yet to be dealt with according to the Land Acquisition Officer. It is now necessary in these circumstances to ask the Revenue Commissioner to hasten the completion of the first stage acquisition and to submit full and accurate information, under dry, wet, garden and houses of all occupied lands that will be submerged in the second stage of 124 feet.

b3. The Committee have overlooked the compensation due to Government for loss of Revenue due to submersion. Sir Visvesvaraya says 11000 acres of wet and garden will be submerged by the entire storage which I take at 120' as the Land Acquisition Officer's figures were compiled four or five years before Sir Visvesvaraya wrote his memo of January 1919. At seven

rupees an acre the loss will be 77000R. a year. On about 12000 acres of dry land the loss will be about 150000R. a year. Between 120' and 124', we may put the loss under dry, wet and garden at 5000R. Adding the anna cess the total loss of Land Revenue will be at least a lac a year. This loss following immediately on submersion has been ignored by the Committee, though they have taken care to credit the Lake with the irrigation Revenue from the upper canals, though two of them are extensions of existing ones, one was sanctioned by the late Maharaja so far back as 1893 and all three are above the Reservoir. The capitalised value of the assessment and cess lost by submersion, about 25 lacs at the prescribed rates, should therefore be added to the capital outlay on the Reservoir. In the alternative we must debit a lac to the irrigation Revenue due to the Dam. The Committee have done neither.

(c) In para 12 of the report, it is said that the storage could be raised from 106' to 124' at a cost of seventeen lacs 'excluding protection works for the weir valley'. There is no other reference to these protective works either in the report or in the explanatory memo to the fore-cast table. In that table however under column 2 there is a provision of two lacs a year from 30-31 to 34-35. This ten lacs I take to be the cost of protection works. Mr. Krishna Iyengar told us that those works would cost us anything between 15 and 50 lacs. If the ten lacs shown in the table really cover those works the Committee should have told us so, and shown how Mr. Krishna Iyengar was wrong. It is a serious omission and the Committee apparently forgot they were reporting to higher authority. Mr Krishna Iyengar's estimate of 15 to 50 lacs on protective works will probably be necessary to ensure the safety of the Dam.* We may safely add 40 lacs to the Committee's ten lacs. The Committee has also overlooked the cost of raising the Dam to 130feet above the height found suitable for a

* as the fall from 124' to 106' to the weir will be more forceful and destructive than one from 118' to 110' assumed by Mr Krishnaiyengar.

a storage of 106. This however is a small item, about two to four lacs. In the result the cost of the Reservoir works will rise from the Committee's figure of 232½ lacs to nearly 360 lacs even apart from compensation in the second stage. If the Committee's statement that 10000 acres of wet will be submerged in the second stage is not a lapse the total expenditure on the Dam will amout to about four hundred lacs.

(4) The Committee assume 5½ per cent for interest charges. Our 6¼ per cent bonds sell at 97 and that in response to the recent issue of Government of India Bonds at 5 per cent . Mr Banerji who knows our financial prospects better says ' Mr. Forbes can pay twenty lacs a year obtaining of course 6½ per cent interest from the Krishnarajasagara Revenue'. We are now heavily in debt. Our Budget estimates for a net loss of 12¾ lacs in 23-24 on the Railways worked by the State. We have sterilised the old sections resumed from the company by costly State management. The Bangalore - Mysore section which paid eight to nine per cent in the hands of the company pay us only three to four per cent. The iron works are a white elephant. The capital outlay has doubled and the root-trouble is we cannot sell our pig. So far back as 1916 Mr. Perrin told us our pig will be unsuitable owing to its high phosphous content for any acid steel process, and the Kemmangundi ore is worse in this respect than the Bhattanhalli ore we now work. The former is our mainstay for the future. We cannot compete with the iron works in Jamshedpur and Asonsol and these are struggling for existence as appears from the evidence before the Tariff Board. Dr Marshall who appears to be a capable and wide-awake engineer estimates as the result of a comprehensive survey of all possible demands that we cant sell more than 40 per cent of our output of pig. As a matter of experience, too we have not been able to sell more than a third of our pig. In the result we must lose fourteen lacs a year as interest and twelve more lacs on pig iron we cannot sell and

have to store at extra expense. Our loss under Railways and iron works will thus be forty lacs a year and the Champion Mine is disappearing before our eyes. If the other Mines go its way, in fifteen years we shall lose about sixty lacs of [redacted] Revenue. In these circumstances we must fix the interest charges at a minimum of six and half per cent. Taking the fore-cast table, the total outlay on all heads to end of 64-65 is shown as 650 lacs. If we add 170-+ 38 lacs the extra cost of the Dam and the High level canal as shown above, the interest charges on 855 lacs at 6½ per cent will amount to 55.6 lacs a year. The total net Revenue shown against 64-65 is 43.58 lacs. The result will be a loss of twelve lacs a year instead of a net profit of 15.72 lacs shown in the table. Adding twenty lacs a year for 35 years as the average net annual loss the net capital outlay will be 1520 lacs and the net Revenue of 43.58 lacs gives a return of less than three per cent involving a loss of 52 lacs a year instead of the 6.71 per cent shown in the fore-cast table against the year 64-65

13. But even this return of three per cent will be possible only by making a hotch-pot of the original Power Works of 1902, the first or Power stage and the second or Irrigation stage. In para 35 of the report the Committee say 'this statement clearly shows that even under the test adopted by the Government of India in such cases, the combined project would prove a remunerative undertaking as it will from the commencement give a surplus over interest charges on the capital outlay'. But the Government of India Form IV has nothing to do with combined projects. It was prescribed to test Irrigation projects pure and simple with refrence to their cost and yield of irrigation Revenue. The Committee have misrepresented and misapplied the Government of India's test. That test can be applied only to the cost of the Irrigation stage of the Reservoir and its adjunct the High level canal, and the Irrigation Revenue therefrom. The 2nd stage

and the High Level Canal will cost about 450 lacs and pay 9.3 lacs at the end of 35 years or about 2%. Adding interest charges till 1964-65 the net capital outlay will reach roughly 1200 lacs and yield ¾%. Paying Power production is the raison d'etre of the 1st Stage Reservoir and a seperate estimate was made on purpose for 66½ lacs. Even on an outlay of 104 lacs the power stage yields 8%. But the Power Revenue is a fluctuating item and depends chiefly on the duration of the mines. The irrigation stage was tacked on to the power stage as a very remunerative irrigation investment unlike the Marikanave. But the second stage pays less than one per cent. Nothing daunted and in true Brahminical spirit our Engineers transfer a good portion of the uncertain profits from the Power stage to the irrigation stage for a long term of 40 years and truimphantly point out that the average return from the combined schemes answers the test prescribed by the Govt. of India for productive Irrigation schemes pure and simple. It is to be regretted the Committee allowed themselves to indulge in transparent camouflage of this kind. The figures in the Forecast Table are vitiated by another serious and inexplicable error. Having discussed and laid down in para 32 of the report that only 75 lacs could be expected under contribution and sale of waste lands, the table takes credit for 114 lacs. That is altogether shocking.

14- It would appear however that the works have now progressed to such a stage that the waste weir for the 80' storage cannot, consistently with the safety of the dam, long be retained at its present level. We have now it is stated, to place the waste weir sill at 106' and perforce we have to store 106' of water. That being so, the committee in para 33 of the report try to show that we have only to incur the cost of making the canalana the additional cost of raising the storage from 106' to 124' to secure 4.8% from Irrigation in the second stage. But these are not the only items of cost subsequent to the raising of the storage to 106'. No account is taken of compensation for lands submerged between 106' and 124'. In their perfunctory way they have debited to the 106' storage compensation due in the second stage upto 120' and have not taken the

taken the trouble to ascertain the area of occupied lands that would be submerged between 120' and 124' and the compensation payable therefor. As the submersion between 106' and 124' is 10[illegible]00 acres while that between 92' and 120' is 13700 acres and the cash compensation for the latter is estimated at 21 lacs, we may roughly assume a compensation to the ryots of 15 lacs and to Government, of 5 lacs for loss of Revenue and cess. Again the Committee overlooks the item of protection works for which ten lacs appear to be allotted as the last item of expenditure under 'Reservoir' in the Fore Cast Table. Adding 50 lacs for Protective Works and 20 lacs for compensation, the Committee figure of 191lacs will have to be raised to 261 lacs. Again the expenditure on the canal begins in 1925-26, that on the shutters in 1926-27 and that on the Protection Works in 1930-31 and it is only in 1961-62 the canal yields its maximum Revenue. If we debit 6½ per cent for interest and take the annual loss from 1925-26 to 1964-65 into account, and add the same to the outlay, the net outlay will reach 600 lacs on which the return will be about 1½ per cent resulting in an annual loss of 30 lacs. So far I have assumed with the Committee that the storage can safely be raised to 124' and that it will be sufficient to irrigate 120000 acres. Mr. Dalal says that it would be dangerous to raise the storage above 118'. Mr. Dalal also differs from the majority on the question whether the High Level Canal should be taken through the Hulikere Tunnel or the Algod Tunnel. These questions I will now consider.

15. I will take up first the question whether the net storage at 124' will suffice to irrigate 120000 acres. In his memo of January 1919 Sir Visvesvaraya assumes an average duty of 70 acres for Monsoon irrigation and 85 for perennial and fixes the capacity at 2200 cusecs. When he assigned 85 acres of perennial crop to a cusec he over-looked the fact that ¾ of this crop was proposed to be sugarcane and that a cusec irrigating 71 acres of rice land will irrigate only 60 acres of cane land. That is what I find in Mr. Rangiah's paper on 'Cauvery Arbitration'. 2540 cusecs

will therefore be required to irrigate 80000 acres of rice land, 30000 of sugarcane and 10000 of other perennial crops. S i r Visvesvaraya was dealing with a maximum storage of 118' and the net storage above 64' after allowing 900 cusecs to Sivasamudram will be insufficient for the irrigation of 120000 acres even assuming his high duties of 70 and 85 acres. As the Committee however propose to raise the storage to 124', we shall have an extra 8000 M.C.ft and this error may be overlooked.

16. Admittedly however the high duties proposed by Sir Visvesvaraya have never been realised in Mysore. Sir Visvesvaraya says that the duty under existing channels is only 25 to 30 acres per cusec. A million C.ft now irrigate about 2¼ acres and Sir Visvesvaraya proposes to make the same quantity do duty for 5¼ acres. It is said that a million C,ft irrigate six acres in the Madras Deltas and that we must reach this level by 'strict control from head to tail' regulation, regimentation and economising. Our Officers must be taught to 'control on scientific lines' and our ryots to economise. In Bombay where the irrigation Commission examined 20 storage works the average area irrigated by a million C,ft under these works did not exceed 3.6 acres on an average of ten years. According to Sir Visvesvaraya we must assme that the efficiency of official control and the ryots' good sense vary as 6: 3.6 and 2.25 respectively in Madras, Bombay and Mysore. These assumptions though they appear plausible are not borne out by our experience in Mysore. Under Marikanve where the block system is being enforced by a special establishment we have not been able to secure a duty of more than 30 acres a cusec. In our Agricultural Farms like the one at Naganahalli where everything is presumably scientific, we consume I understand more water in proportion than our much-abused ryot. If we defy experience and natural laws and stint our supply to 2/5 of the usual allowance, we shall confiscate the ryots' property including those of the two non-official members of the Committee, lose our Land Revenue and make our storage worse than infructuous. Unlike the ryots under existing channels the Mandya and Malavalli

ryots have little or no experience of channel irrigation and with a drier climate and a sandier soil will probably consume per acre more than the Seringapatam ryot.

17. Even a superficial consideration of local conditions suggests that the true causes of the low duty of a cusec in Mysore are to be found in the configuration of the country, its climate and its soils. No amount of training will enable our ryot to prevent water drainingdown a slope, or rapid evaporation by the Sun's rays under a thin dry atmosphere. He cannot make his sandy soil absorb or retain more than a third of the moisture absorbed and retained by a good clay. These are his handicaps and I will discuss them one by one. (a) In Mysore the land was thrown into waves as a result of the wild commotion attendant on the sinking of the Gondwana Continent. The effect of this undulated surface is that there is a perfect natural drainage all over the country and only terrace cultivation is possible. R.S.V. Mr Subba Rao makes the following pertinent remarks in para 19 (c) of his project report: 'Out of the quantities of water drawn off in our channels for irrigation, very large quantities return quickly, owing to the steep slopes of the country and the nature of the soil, to the river'. It was a convincing reason which Mr. Subba Rao gave, out of the fulness of his local knowledge, to dissipate Madras fears of the over-depletion of their supplies by our Reservoir, but it is an equally convincing reason why our ryot requires a more liberal supply than his brother ryot in the Madras Delta or the Deccan Plateau. These latter are almost perfectly flat, the former being made up of horizontal beds of far-travelled consolidated silts deposited near the sea and the latter of the horizontal flows of Vamana Vishnu (Deccan trap) when he over-whelmed Mahabali Chakravarti (High level laterite) in the early Eocene and overspread 200,000 square miles to a depth of several thousand feet levelling all irregularities of the surface. Obviously our ryot requires a great deal more water per acre than the Madras and Bombay ryots whose lands are flat as a table.

(b) Our soils are, compared to Bombay and Madras soils, more

or less sandy. Here it is largely broken down silieeous gneiss. In Madras it is fine far-travelled silt consolidated into a retentive clay. The decomposed trap of Bombay is one of the most retentive as well as fertile of soils. 'Strong clays absorb and retain nearly three times as much water as sandy soils do'. 'A stiff clay may appear quite dry and yet retain 50 per cent of moisture'. 'A silicious sand will give off the same weight of water in the form of vapour in one third of the time necessary to evaporate it from the stiff clay. Hence the reason why plants are soon burnt up in a sandy soil'. 'A good clay will absorb 1/30 of its own weight of moisture from the air during nights, while sand absorbs little or no moisture from the air'. In these circumstances our ryot will require a great deal more water for his sandy soil than the Madras and Bombay ryot for their absorbent and retentive clay.

(c) Our climate is exceedingly dry. Turn the handle of a voss' machine ever so quick in Madras we get no sparks. If the machine is put in the mid-day Sun for an hour it emits a few feeble sparks. The same machine in Bangalore when the monsoon rain is falling will give a series of bright sparks with a few turns of the handle. In the dry climate of this high plateau, evaporation even in winter is very great. In the Madras Deltas close to the sea, the atmosphere is humid and evaporation at a minimum. Large parts of the Deccan plateau however are as dry as Mysore. Madras and Bombay are both flat and possess a retentive clay. Madras is humid, but Bombay is dry. Mysore has steep slopes, a sandy soil and a dry climate. Our ryot is therefore handicapped in every way. It is these differences in configuration, soil and climate that account mainly for the varying duties of a cusec (6.3.6 and 2.25 acres per million C,ft) in Madras, Bombay and Mysore. I may add that in the case of lands immediately behind a tank-bund and subject to percolation, the cusec may perform a very high duty, but that is neither here nor there.

18. The Manaya taluk is exceptionally dry. The Gazetteer says 'the soils for dry crops are as a whole poor, being sandy and gravelly and in some places very stony'. If under the Mari-

Marikanve and with retentive black cotten soil and with less steep slopes we are able to secure only a 30 acre duty to the cusec, we cannot in reason expect a duty of more than 22½ acres in Mandya. Assuming an average duty of two acres to a million C,ft in Mandya and Malavalli, it is not possible to irrigate 120000 acres under the High Level Canal even with a storage of 124' in the Krishnarajasagara. Out of the net storage of 44000 M.C.ft between 64' and 124', about 12000 will be needed for Sivasamudram, the Lower Level canals and summer irrigation under existing channels below the dam. The balance of 32000 M.C.ft will irrigate only 64000 acres. Again I find from Mr. Rangiah's 'Cauvery Arbitration', Appendix VIII that in one out of thirteen years the balance in the imaginary Reservoir was only 14800 M.C.ft at the end of October. This no doubt was an exceptional year. In two other years the balance was 8000 and 9500 M.C.ft under normal. In three other years the deficiency varied from 2500 to 5000 M.C.ft. So that apart from the famine year of 1899-1900, we may anticipate two years of serious shortage out of twelve and three years of appreciable shortage. This circumstance further discounts the utility of the High Level canal. Further, owing to its excessive dryness, there will be fierce evaporation in spring and summer in Mandya. Mr. Krishna Iyengar estimated the loss due to evaporation from the Dam to Sivasamudram over the wet bed of the Cauvery at 25 per cent. If that is so, the loss in spring and summer in Mandya with the waters dispersed through many miles of open channels and distributaries, now filled and now dry, must be at least 60 per cent. Summer cultivation therefore under the High Level Canal must be ruled out: Otherwise the needs of Mandya may conflict with those of Sivasamudram and hot weather irrigation under existing channels. And yet the Committee make the High Level canal chiefly subservient to Mandya and that leads us to the question of Algod-vs-Hulikere on which there is a sharp difference of opinion between Mr. Dalal and the other Engineers of the Committee. Before passing to it I must express my surprise

at the failure of the Committee to enlighten us as to why they assign a larger duty to the cusec than is realised under existing channels.

19. From the draft report of the Committee dated 6-12-21 I find that the Hulikere Tunnel will be one and three fourth mile long while the Algod tunnel will be only 5/8th of a mile. In para 44 of that draft the cost of the canal to the lower end of the Hulikere tunnel is put down as 125.5 lacs. Taking the cost of the canal upto the saddle ($22\frac{1}{2}$m) at 60000 Rs a mile the cost of the tunnel will be 112 lacs. I take it that the Algod tunnel will cost 40 lacs proportionately to its length of 5/8th of a mile. The difference in the cost of making the two tunnels is thus 72 lacs. If the additional length of the canal (10 miles) necessitated by the Algod rute costs 12 lacs, the Algod alignment will be cheaper by 60 lacs. In para 32 however of the draft it is said 'if Algod tunnel is taken up, the cost will probably be five lacs less, the tunnel being of shorter length'. That a tunnel of $1\frac{3}{4}$ mile should cost 112 lacs and one of 5/8th mile only five lacs less seems incredible to a layman. The main reason of the Committee for preferring the Hulikere tunnel is 'that the protection of Mandya, one of the driest taluks in this region is very important'. The answer to this is, that the Algod tunnel will bring a tenth of the area of the Mandya taluk under irrigation and that area is 5000 acres more than the total extent of the channel lands in the Seringapatam taluk. That surely ensures, in all reason, more than ample protection to Mandya. The Committee admit 'it is true the Malavalli ryots are richer and the lands there, are of better quality'. As that is so and the Algod tunnel will give more channel irrigation to Mandya than there is in Seringapatam, good sense requires that the storage created at such heavy cost should, as far as possible, be utilised, in the best interests of the State, where it will prove most fruitful. If ever we get a chance of profitably electrifying agricultural operations it will be in Malavalli, not Mandaya. From every point of view, therefore, productivity, capabilities of the ryot and proximity to the C. P. Works, we must concentrate our irrigation in Malavalli through the cheaper Algod tunnel.

But the Committee clinches the matter by saying that the people of Mandya would be much disappointed if a large extent of their lands is not brought under irrigation'. Here the Committee appear to be guided by the principle of 'kissing goes by favour' and no answer is possible.

20.. The way in which the majority of the committee deal with Mr. Dalal in connexion with the Algod tunnel is altogether surprising. Mr. Dalal had once suggested a contour channel which as a reasonable man he abandoned when satisfied that it was impracticable. That he abandoned it is clear from the draft report of 6-12-21 in which no reference is made to it. On the other hand the Algod tunnel is discussed and criticised in paras 32 to 34 of that report as the one preferred by 'our colleague Mr. Dalal'. Replying to this criticism four days later on 10-12-21 Mr. Dalal said 'whatever be the report of the Superintending Engineer Mr. Srinivasiengar on the Hulikere V Algod tunnel, my advice to Government is that both lines must accurately be estimated for and then only Government must decide which route is better'. In the final report however of 22-2-22 the majority of the Committee clean ignore the Algod tunnel, rake up the Contour channel and beat a dead dog. On 14-2-22 when he received the final draft Mr Dalal wrote 'I find that in this final report you have only mentioned my proposal to go along the contour. I abandoned this after examining the plans. I then said that the Algod tunnel will be better than the Hulikere and gave my reasons for it. You have omitted this in this final report to Government'. In spite of this the final draft was submitted to Government on 22-2-22 without alteration or explanation. Mr. Dalal makes a personal reference to Superintending Engineer Mr. Srinivasiengar over the head of the Chairman and that suggests that Mr. Dalal thought that Mr. Srinivasa Iyengar was unconciously biassed in favour of Mandya and had imposed his views on his Chief the Chairman of the Committee and it struck me that Mr. Dalal was possibly referring to the fact which came

under my notice as a Judge that Mr. Srinivasa Iyengar had acquired extensive lands near Mandya.

21. I now come to the difference between Mr. Dalal and the majority as to the height to which storage can be r-aised consistently with the safety of the Dam. In paragraphs 4 to 11 and 14 of his letter dated 10-12-21 Mr. Dalal gives cogent and detailed reasons in support of his views on this all important question and those reasons demand the most careful consideration. Mr. Dalal was in charge of the Marikanve Dam from the day it was started, and saw it through to completion. He has been an irrigation Engineer ever since and is now in charge of the Himayat Sagara Project. Our Chief Engineers colonels Bowen, McNeil Campbell and McHutchin considered him a most realiable Engineer and what is more he possessed the unstinted confidence of Sir Seshadri Iyer, a born Engineer whom Chief Engineers feared and envied. When such a man uses the words contained in paras 7 and 14 of his letter, we must take it that the raising of the storage will be fraught with imminent danger to the Dam. But the superior and light hearted members of the Committee simply ignore his warning. His views were not even referred to in the final draft and though Mr. Dalal reiterated his objection in his letter of 14-2-22, his protests fell on deaf ears and the report was sent to Government on 22-2-22 as it had stood. The bare assertion contained in para 7 of the report that the Chief Engineer-Chairman had entered into an unratified agreement with the Madras Chief Engineer by which it would be necessary to ultimately raise the storage to 124' is no answer to Mr. Dalal's objection.

22. In this connexion I may notice a curious feature in the report and that is that the non-official members make themselves responsible for opinions and criticisms on questions of engineering technique. In para 7 of the draft of 6-12-21 it was properly stated that a mixed Committee of technical and non-technical members felt unable to deal with the revised estimate for the second stage from a professional point of view. No such reservation is made in the

final report of 22-2-22. It is evident that the other Engineers are unable to meet Mr. Dalal's objections to the Hulikere tunnel and to the raising of the storage to 124', but they were 'patriotically anxious to secure irrigation for 12000 acres (which was the raison 'd' etre of the second stage) and to save the 'Mandya people' from disappointment, and have therefore ignored the objections in an ostritch-like manner inconsistent with their duty to Government and the courtesy due to a colleague.

23. In the result I have shown that even if we assume that the High Level Canal will cost only 245 lacs and take into account only the expenditure required after raising the storage to 106', we can ensure even with the water-level at 124', only 64000 acres of monsoon irrigation. The net value of the Paddy raised on 64000 acres will be less than the annual loss to the state in the shape of interest on the net capital outlay. If we reduct 4' out of the storage for uplift as suggested by Mr Dalal in para 8 of his letter of 10-12-21 the balance will suffice to irrigate only 54000 acres. If as Mr Dalal advises we limit the storage to 118' the result will be much worse. I am clear in these circumstances that the High Level Canal should be finally abandoned and that the storage should be stopped for the present at 106' at the permanent site of the waste weir.

24. The question now arises 'what should we do with the extra storage?' The total storage at 106' is 28800 M.C.ft. Reducting the storage at 64',5300 M.C.ft,and about 12000M.C.ft for Sivasamudram Low Level Canals and hot-weather irrigation under existing channels,a balance of 13500 M.C.ft will be available and suffice to irrigate 30000 acres. Taking years of shortage ,5 out of 12,into consideration we can safely extend irrigation by 25000 acres. In years when the shortage is serious we can store 4' more of water by a temporary masonry wall 4' high at a cost of a few thousands rupees as suggested in para 12 of the draft report of 6-12-21. The 25000 acres can best be secured under extensions of the Low Level Canals and the C.D.Sagar and Virjanadi channels as suggested by Mr Krishnaiengar in para 12 of his note of 14-9-19. Mother

Cauvery when her milk is utilised close to her udder is very fruitful even from a Revenue point of view. Mr. Krishna Iyengar estimates the cost of extending the channels at 150R. per acre of irrigated land. For 25000 acres the cost will be 37½ lacs. If we progress slowly without creating a surfeit, we may secure an average per acre of 80R. by way of contribution and sale proceeds. The net cost of the extensions will be only 17½ lacs on which we shall have a return of one and half lacs or eight and half per cent on the net outlay which is as good as the return from the Power Works. Again in the first para of his note of 21-2-21- Mr. Forbes says that water passed through the turbines at the dam itself (will give up its energy twice instead of one time) and that transmission losses would be at a minimum as by a very short line the energy could be fed into the existing circuits. I infer from these statements that our turbines at the Dam will create 3000 H. P. twice or 6000 H.P altogether and that our net Power Revenue from the Dam Station will be nearer ten lacs than four lacs. If the cost of the second stage upto 106' and that of the Power Station is taken at two hundred lacs the latter alone will return five per cent on the outlay, a silver lining in the cloud. As for the Mehedhat installation it was an excellant and fruitful idea of the late Mr. Arunachala Iyer who died so early. As the demand for Power is so uncertain we may secure the right to utilise the rapids for Power Generation, but that is all we can do for the present.

I.P.